The European pond turtle (*Emys orbicularis*) in the Steppe Zone of the Ukraine

T.I. KOTENKO

Abstract

Emys orbicularis is widely distributed in the Steppe Zone of the Ukraine and most abundant in the deltas of big rivers. Data are presented on distribution, habitats, abundance, seasonal and daily activity, migrations, reproduction, diet, enemies and parasites, collected between 1974 and 1999 .

Key words

Emys orbicularis, distribution, ecology, Ukraine.

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Introduction

The European pond turtle, *Emys orbicularis* (LINNAEUS, 1758), is distributed all over the Ukraine (Fig. 1), but is most abundant in the southern part, in the Steppe physicogeographical zone. This zone occupies about 40% of the territory of the Ukraine and includes deltas of the largest rivers of the country (the Dnieper, Danube, Dniester), which act as large natural reserves for *E. orbicularis*. The whole Ukraine (including the Steppe Zone) is inhabited by *E. o. orbicularis* (LINNAEUS, 1758), the Crimean Mountains probably by *E. o. hellenica* (VALENCIENNES, 1832), as was shown recently (FRITZ 1992, 1994, 1996, 1998, SZCZERBAK 1998).

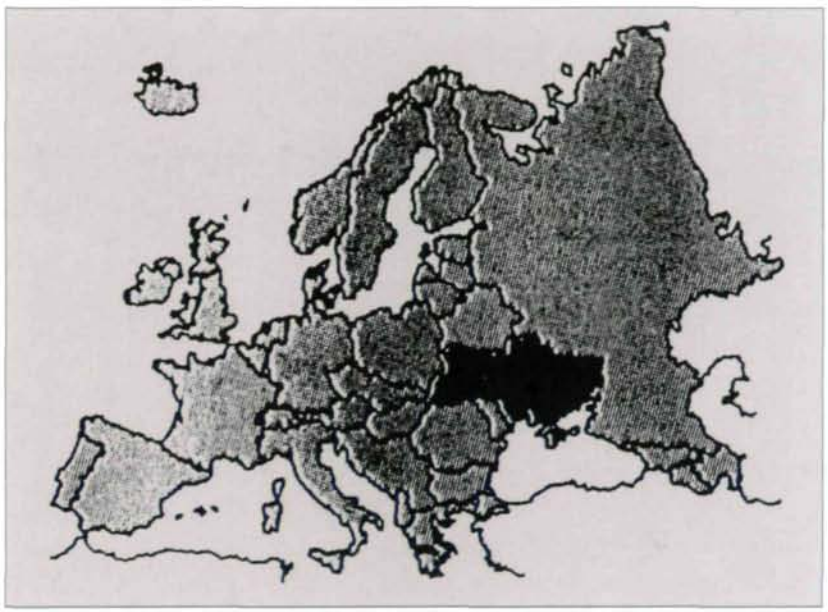


Fig. 1:
Map of Europe showing the territory of Ukraine (shaded).

Data on the distribution and ecology of *E. orbicularis* in the Ukraine and its two regions - the Crimean Peninsula and the Carpathians – have been summarised in several monographs (PASHCHENKO 1955, TARASHCHUK 1959, SZCZERBAK 1966, SZCZERBAK & SZCZERBAN' 1980) and by SZCZERBAK (1998). The latter is based on the data of N.N. SZCZERBAK and on materials of his colleagues and students, including specimens deposited in the Zoological Museum of the National Academy of Sciences of Ukraine. My data on the distribution of *E. orbicularis* were also partially included in that article. The following presentation is based on own data gathered in 1974-1999 (the Steppe Zone, distribution and ecology), data collected with A.A. FEDORCHENKO (the Danube Delta, reproduction in 1986-1989), and on data from personal communications and literature. Some of our results are already published (KOTENKO 1977, 1987, 1999a, 1999b, KOTENKO & FEDORCHENKO 1993). Our observations in the Danube Delta on tagged turtles (KOTENKO & FEDORCHENKO in lit.) provided new results on the reproductive biology of *E. orbicularis* for this part of its range and is the first study of such kind in the Ukraine.

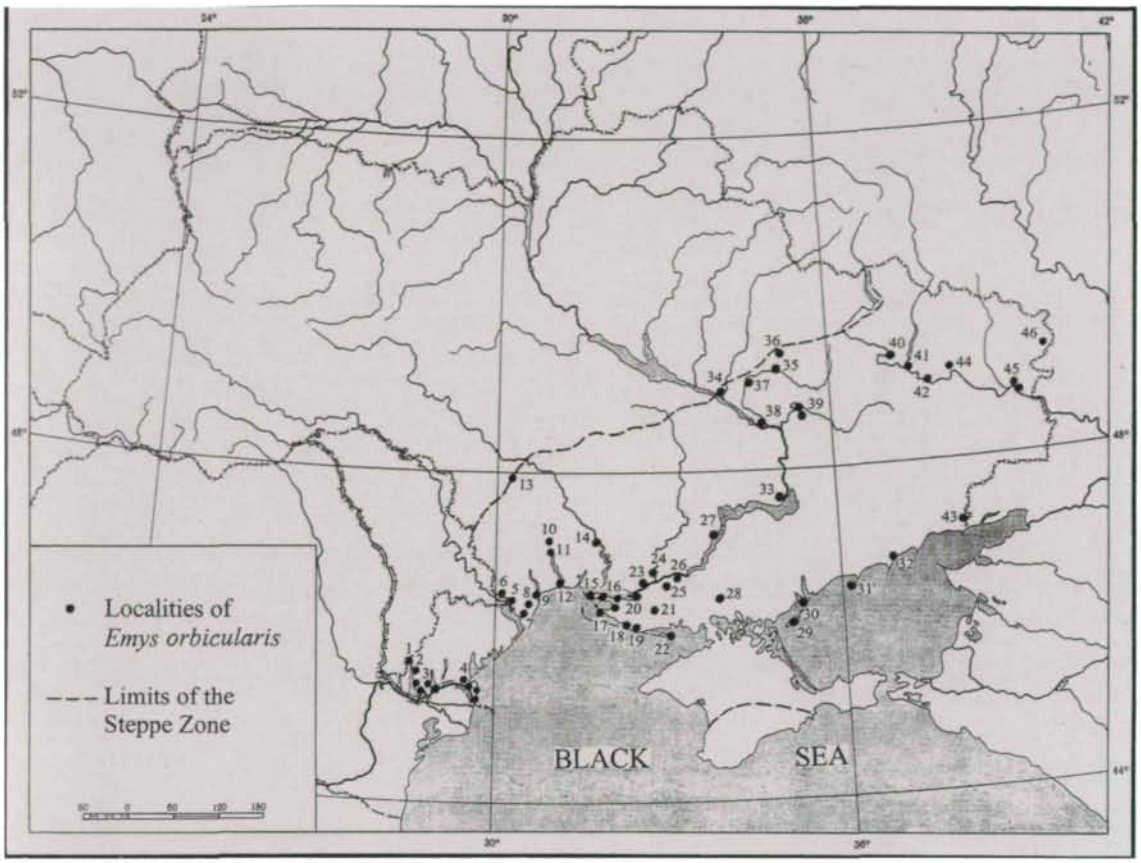
Material and Methods

The data were obtained between 1974 and 1999 throughout the territory of the Steppe Zone of the Ukraine and some adjacent areas. Ecological data were gathered mainly in the Danube and Dnieper deltas. Records on habitats and abundance were obtained while mapping the distribution of lizards and snakes. Ecological findings stem from live turtles; the diet, endoparasites and some aspects of reproduction, from 17 dissected specimens from the Kherson region. Reproduction of the Danube Delta population has been examined with tagged females from an isolated plot on Poludenny Island (an orchard surrounded by narrow canals), a small dry land area within the reed wetland adjacent to the Ochakivsky Arm of the Danube River. The plot was very suitable for such a study because it enabled to observe many turtles in a small area, and the recording of individuals on their way to a breeding ground and back to the Ochakivsky Arm, using fishpots fixed in canals (see KOTENKO & FEDORCHENKO in lit. for details).

Results and Discussions

Distribution

Our data on the distribution of the pond turtle within the Steppe Zone is presented on Fig. 2. Due to difficulties in locating *E. orbicularis*, records of this species (which usually result from sketchy area surveys) do not reflect its real distribution. Good results come from investigations during the reproductive period, especially on sand terraces of rivers, sand seaside levees and spits, with remnants of eggs of destroyed clutches and tracks of females on



Odeska Oblast (Odesa region)
Bolgradsky Rayon: 1 – Bolgrad* [mouth of the Veliky Yalpug]; 2 - Topoline* [Yalpug Lake]; Izmailsky Rayon: 3 - Ozerne* [Yalpug Lake], Stara Nekrasivka [Kugurluy Lake], Nova Nekrasivka [Lung Lake - the Danube], islands Maly Daler and Tataru [the Dunai (the Danube)]; Kiliysky Rayon: 4 - the Dunaisky [the Danube] Biosphere Reserve: Desantne, Primorske, Leski, Vilkove, Stentsivsko-Zhebrianski Plavni (reedbed), Zhebrianske Pasmo (marine levee), islands Yermakiv, Poludenny, Kubanu, Stambulsky etc. [the Danube Delta]; Bilayivsky Rayon: 5 - Bilayivka [the Turunchuk - arm of the Dnister (the Dniester)]; 6 - Troyitske* [the Turunchuk]; Ovidiopolsky Rayon: 7 - Baraboy* [the Baraboy]; 8 - Sukhy Liman* [the Sukhy Liman]; 9 - Odesa*; Berezivsky Rayon: 10 - Viktorivka* [the Tiligul River]; 11 - upper reaches* of the Tiligul Liman; Kominternivsky Rayon: 12 - barrier beach of the Tiligul Liman.

Mikolaivska Oblast (Mikolaiv region)
Vradyivsky Rayon: 13 - Sirovo [the Kodima]; Novoodesky Rayon: 14 - between Kovalivka and Andryivka [the Pivdenny (the Soåuthern) Bug]; Ochakivsky Rayon: 15 - Volyzhin Lis (Volyzhin Forest) area of the Chornomorsky (the Black Sea) Biosphere Reserve (ChBR) [the Dniprovsky (the Dnieper) Liman].

Khersonska Oblast (Kherson region)
Golopristansky Rayon: 16 - Geroiske, Solonoozerna area of ChBR, Vinogradne, Rybalche, Ivanivka, Ivano-Rybalchanska area of ChBR [the Dnieper Liman]; 17 - Yagorlitsky Kut area of ChBR; 18 - Potyivska area of ChBR; 19 - 3 km eastwards of Zalizny Port*; 20 - Gola Pristan [the Dnieper Delta]; 21 Burkuty, Vinogradivska Arena of Nizhnyodniprovsky Peski (the Lower Dnieper Sands) [ancient terrace of the Dnieper]; Skadovsky Rayon: 22 - Jarilgach Island; Bilozersky Rayon: 23 - Veliky Potyomkinsky Island [the Dnieper Delta], 24 - Daryivka* [the Ingulets]; Tsurupinsky Rayon: 25 - Kozacholagerska Arena of the Lower Dnieper Sands; Novokahovska mis'ka rada: 26 - Dnipryany [the Dnipro (the Dnieper)]; Novovorontsovsky Rayon: 27 Gavrilivka* [Kakhovske Reservoir of the Dnieper]; Chaplinsky Rayon: 28 - the Biosphere Reserve "Askania-Nova"; Genichesky Rayon: 29 - Biruchy Island - an area of the Azovo-Sivasky National Nature Park.

Zaporizka Oblast (Zaporizhzhya region)
Yakimivsky Rayon: 30 - Kirilivka* [the Molochny Liman]; Primorsky Rayon: 31 - Obitichna Spit*; 32 - vicinity of Berdyansk [mouth of the Berda]; Zaporizky Rayon: 33 - Krutoyarivske forestry department near Bilenke [the Dnieper];

Poltavska Oblast (Poltava region)
Kobelyatsky Rayon: 34 - below Luchki [the Vorskla]; Mashevsky Rayon: 35 eastwards of Ryaske near the border of Kharkivska Oblast [the Oril]; Karlivsky Rayon: 36 - Fedorivka* [the Orchik].

Dnipropetrovska Oblast (Dnipropetrovsk region)
Tsarichansky Rayon: 37 - Babaikyvka [the Oril]; Petrykivsky Rayon: 38 Mikolaivka, the Dniprovsko-Orilsky Nature Reserve [the Dnieper - the Oril]; Novomoskovsky Rayon: 39 - the Samarsky Forest opposite Andryivka and near Znamenivka [the Samara and its sand terrace].

Kharkivska Oblast (Kharkiv region)
Iziumsky Rayon: 40 - Levkivka [the Siversky Donets]; 41 - southwards of Chervony Oskil [mouth of the Oskil].

Donetska Oblast (Donetsk region)
Krasnolimansky Rayon: 42 - Shchurove* [the Siversky Donets]; Novoazovsky Rayon: 43 - Khomutivsky Step - a section of the Ukrainian Steppe Nature Reserve [the Gruzky Yelanchik].

Luganska Oblast (Lugansk region)
44 - Kreminna* [the Krasna]; Stanychno-Lugansky Rayon: 45 - Kondrashivska Nova, Stanychno-Luganske Section of the Lugansky Nature Reserve [the Siversky Donets]; Milovsky Rayon: 46 - Krinichne* [the Cherepakha (the Turtle) River].

Fig. 2:
Distribution of *Emys orbicularis* in the Steppe Zone of the Ukraine. Names of lakes, rivers and/or sand terraces are given within square brackets; English names of reserves etc. are given in paentheses. Geographical names are in phonetic Ukrainian spelling. Rayon (district) and mis'ka rada area (territory of town council) are subdivisions of oblast (region). Stars indicate personal communications of professional zoologists, teachers of biology etc.: R.N. Chernichko, I.G. Gursky, G.S. Kolomiychenko, I.P. Marku, Yu.V. Mishchenko, V.P. Sharpilo and V. Bakhtiarov; sites without stars refer to personal observations of T.I. Kotenko.

sand. Considering the incompleteness of existing data, *E. orbicularis* inhabits the whole Steppe Zone of the Ukraine, and is absent only in waterless areas: in some watersheds of continental Ukraine, in the north-western part of the Crimean Peninsula and in the most parts of the arid region adjacent to lake Civet within the Crimean Autonomic Republic and Khersonska Oblast.

Habitats

According to my observations, habitats of *E. orbicularis* in the Steppe Zone of Ukraine are:

- plavni (reed marshes) of deltas of big rivers (the Danube, Dnieper, Dniester);
- all big (the Danube, Dnieper, Dniester, South Bug, Siversky Donets), medium (the Samara, Oril, Vorskla, Ingulets, Oskil etc.) and many of the small (the Berda, Gruzky Yelanchik, Cherepakha, Krasna, Kodima, Tiligul, Baraboy etc.) rivers, especially within sections with slow current and developed aquatic vegetation;
- big lakes or limans with fresh or slightly brackish water (the Dnieper Liman, the Tiligul Liman, lakes Yalpug, Kugurluy, Anankin Kut and others in the Danube Delta);
- oxbow and other lakes of different size in flood plains (including islands) of various rivers (islands Maly Daler and Tataru on the Danube, Veliky Potyomkinsky Island on the Dnieper, lakes along Siversky Donets in the Kharkiv, Donetsk and Lugansk regions, in the Dniprovsko-Orilsky Nature Reserve and many other sites);
- small lakes (usually inside of birch, oak, trembling poplar or alder groves, sometimes in open territory or surrounded by pine plantations) in depressions among dunes within sandy areas of river terraces or seaside levees (arenas of the Lower Dnieper Sands, Siversky Donets Sands, Samara Sands, terraces of some smaller rivers, dunes of the seaside levee Zhebrianske Pasmo);
- small natural water bodies in narrow depressions between sandy-shell levees on sea spits (Jarilgach);
- water holes made for supplying wild ungulates and cattle with fresh water (sea spits Jarilgach, Biruchy, Obitichna);
- very small water bodies in bomb craters of military training polygons (Kozacholagerska Arena of the Lower Dnieper Sands);
- pools in sand pits (Bilayivka etc.);
- ponds alongside small rivers, in gullies and other places (Krinichne, Askania-Nova, Ivanivka etc.);
- big reservoirs (for example, Kakhovske);
- lakes in saline areas, formed in natural depressions due to an artificial supply of fresh water (Yagorlitsky Kut and Potyivska areas of the Black Sea Biosphere Reserve);
- various canals - irrigation, drainage, effluent, along dykes, and fish ponds (typical for the Danube Delta and irrigation systems in Kherson region).

In summary, *E. orbicularis* inhabits various kinds of water bodies: large and very small, with stagnant or flowing, fresh or slightly brackish water, with different soil composition of the banks and bottom, with or without aquatic and shore vegetation. It prefers water bodies with stagnant or slowly flowing fresh water and rich aquatic (*Ceratophyllum*, *Myriophyllum*, *Potamogeton*, *Lemna*, *Elodea canadensis*, *Hydrocharis morsus-ranae*, *Nymphoides peltata*, *Salvinia natans*, *Trapa natans*, *Nymphaea alba*, *Nuphar lutea* etc.) and reed vegetation (*Phragmites australis*, *Typha angustifolia*, *T. latifolia*, *Scirpus lacustris*, *Iris pseudacorus*, *Carex* etc.). In big lakes or marshes, turtles normaly stay close to banks, dykes and other terrestrial areas. *Emys orbicularis* particularly prefers lakes which are close to sandy areas which serve as breeding grounds. Figures 3-12 demonstrate different habitat types of *E. orbicularis* in the Steppe Zone of the Ukraine.

While in the northern part of the Ukraine populations of the European pond turtle are decreasing, in some areas of the Steppe Zone *E. orbicularis* is extending its distribution and increasing in numbers due to construction of canals, ponds and reservoirs. Using Krasnoznamensky and Northern Crimean canals as well as canals of their irrigation systems, this species has appeared in formerly waterless

Fig. 3:
A stream in the Danube Delta - habitat of *Emys orbicularis* (Danube Biosphere Reserve: Kubanu Island, stream Ribachy Zholobok)

Fig. 4:
Reproduction site of *Emys orbicularis* in the Danube Delta (Danube Biosphere Reserve: marine levee Zhebrianske Pasmo with sandy steppe vegetation and plantations of pine trees, poplars and sea buckthorn).

Fig. 5:
Pasture with waterhole on Jarilgach Island. *Emys orbicularis* inhabits the artificial cattle ponds. Oviposition sites of the European pond turtle are in the surrounding sandy steppe and meadow.

Fig. 6:
Lake with reed vegetation - typical habitat of *Emys orbicularis* in the Lower Dnieper Sands near the Dnieper Liman (Black Sea Biosphere Reserve: Solonoozerna area).

Fig. 7:
Unforested and unprotected parts of arenas of the Lower Dnieper Sands. Dunes with small groves (mainly of birch) and tiny lakes (Vinogradivska Arena: Burkuty site).

areas (including the Black Sea coast) with steppe and solonchak vegetation. Turtles now occupy fresh water lakes which appeared in a large depression of the Potyivska area of the Black Sea Biosphere Reserve as a result of the operation of an overflow canal from rice fields (KOTENKO 1977) and were found in an defluent canal near Zalizny Port in 1998 (V. BAKHTIAROV, personal communication). New habitats for turtles appear due to military activities (bomb training) or the creation of watering places for cattle. Such small water bodies in craters and holes overgrown by hydrophilous vegetation and colonised by aquatic invertebrates generally serve as temporary habitats for *E. orbicularis*.

Abundance

During general herpetological surveys often only single individuals of *E. orbicularis*, often are found, and resultant conclusions on its rarity are often untrue. In cases in which a census was undertaken during the reproductive period, *E. orbicularis* usually turned out to be common. During my general survey of the Danube Biosphere Reserve in 1995-1997 I recorded not more than 2 turtles per day during the non-productive period in June. On the banks of various canals and streams, 1-3 turtles per 1 km were observed for the reedbed Stentsivsko-Zhebrianski Plavni, 1.2-2.5 per 1 km for the Kubanu Island and 2

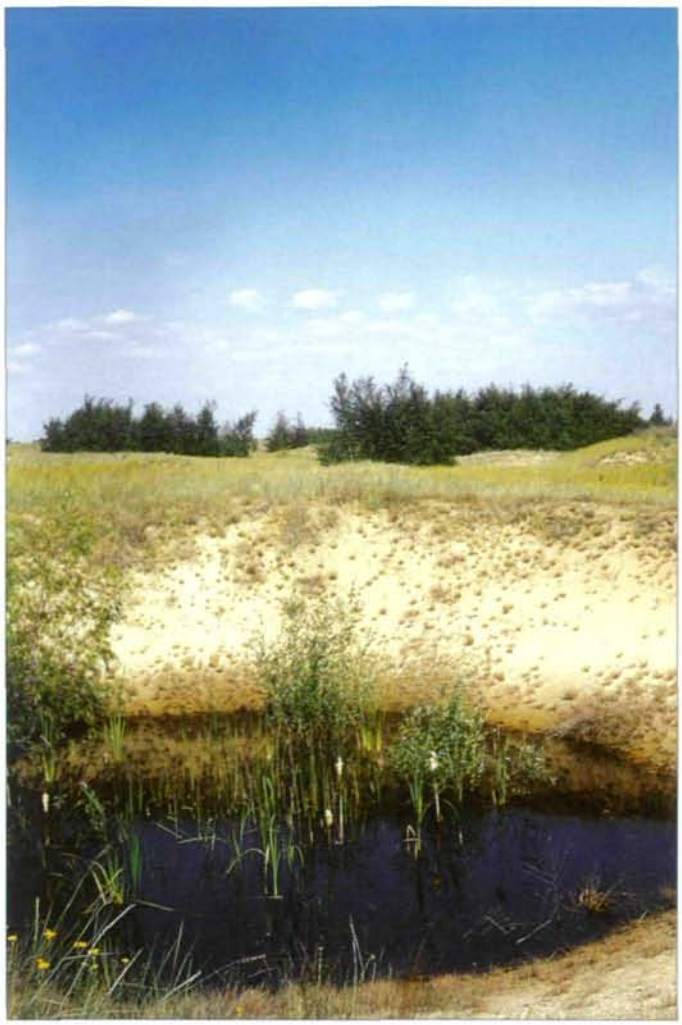


Fig. 8:
Bomb craters create habitats for *Emys orbicularis* and amphibians (area of military polygon on Kozacholagerska Arena of the Lower Dnieper Sands).

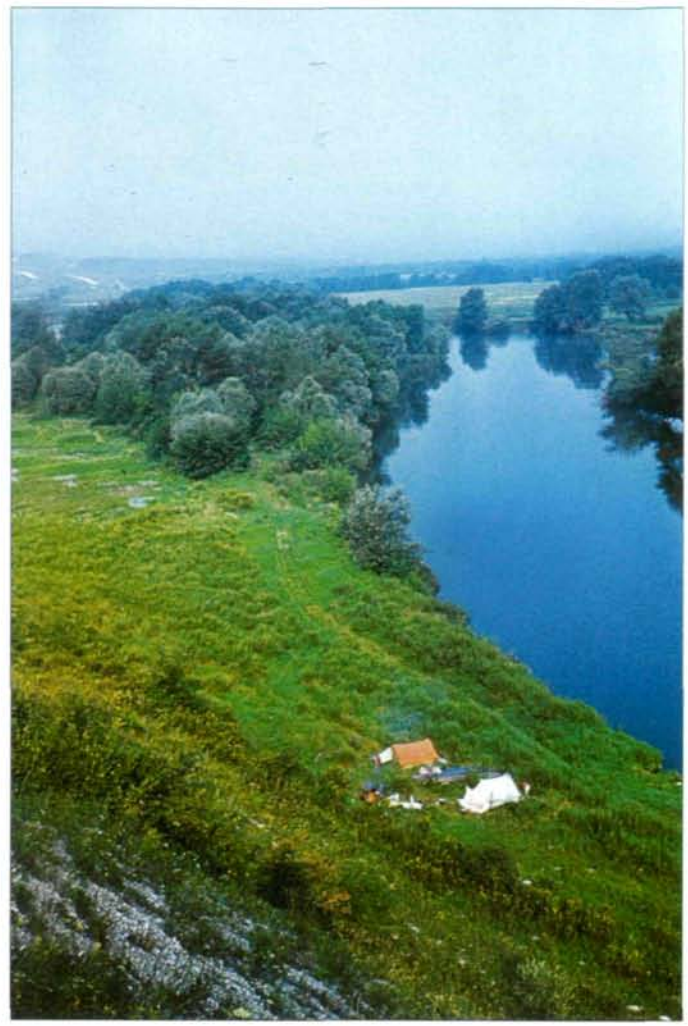


Fig. 9:
A big river in the Steppe Zone of the Ukraine: the river and numerous lakes on its left bank serve as habitat for *Emys orbicularis* (Siversky Donets within Krasnolimansky district of Donetsk region near the "Kreydova Flora" section of the Ukrainian Steppe Nature Reserve).

Fig. 10:
A typical medium-sized river in the Steppe Zone of the Ukraine (Samara near Andryivka in the Novomoskovsk district of the Dnipropetrovsk region).

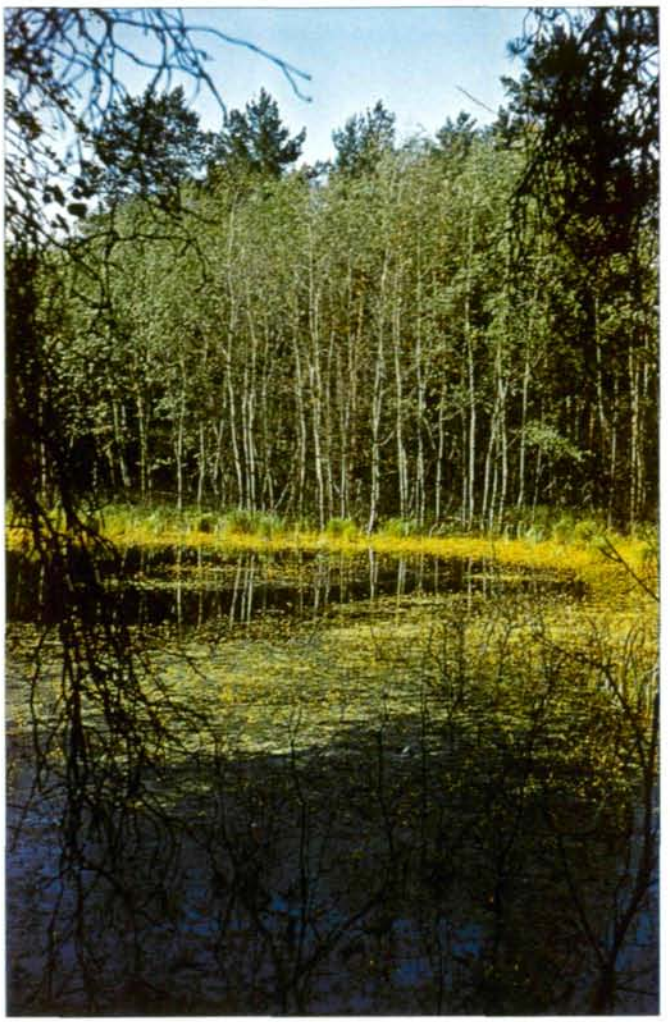


Fig. 11:
A typical lake of the river sand terrace inhabited by *Emys orbicularis* (Samarsky Forest on the left bank of the river Samara in the Novomoskovsk district of the Dnipropetrovsk region).

per 200 m for the Stambulsky Island. On Yermakiv Island (the Danube Delta upstream of Vilkove), in a canal 400 m long and 10 m wide, only 2 turtles were observed per 200 m (i. e. 10 turtles per hectare), but on an adjacent dyke (the only place for oviposition) 45 ruined clutches were found. Since 2 individual racoon dogs (*Nyctereutes procyonoides* GRAY) and 3 holes of common fox (*Vulpes vulpes* L.) were observed in this area, probably all clutches laid were destroyed (see below). Considering that in the Danube Delta a female produces an average of at least 1.3 clutches per "normal" year, and assuming that approximately 35 females inhabit that canal, this would render about 175 turtles of both sexes per hectare. In June, at sites close to water bodies in open sands or in the light pine forest of the Zhebrianske Pasmo marine levee, 3-10 fresh tracks of females per 100 m used to be recorded. Tracks on the sand are clearly visible (Fig. 13) and can be used for rough estimation of abundance of *E. orbicularis* or for identifying the beginning of its oviposition period.

Other data on the abundance of *E. orbicularis* include the following: in Burkuty (Lower Dnieper Sands) in small lakes inside of groves - up to 3 individuals per 100 m of a bank were observed on 14.07.1977 and up to 2 tracks of

Fig 12:
River terrace sands are the favourite nesting sites of *Emys orbicularis* (Samarsky Forest, comp. Fig. 10).

females on sand roads or in a young pine plantation were observed on 23.06.1978; in an oxbow lake in the Stanychno-Luganske Section of the Lugansky Nature Reserve - 3 ind. per 100 m of a bank were observed on 12.05.1976; in the vicinity of Geroiske in the shallow water of lakes and bays of the Dnieper Liman - 1-3 ind. per 100 m were observed on 22-25.05.1979 (Fig. 14); on the Vorskla River bank in Novosanzharsky district of Poltava region (the Steppe-Forest Zone near the border with the Steppe Zone) 10 ind. were basking within 10 m on 1.05.1979; between 3.-13.03.1998 in an effluent canal near Zalizny Port while cleaning the canal bottom, an excavator operator V. BAKHTIAROV (personal communication) dug out 20 to 30 turtles per 1 km (i. e. about 100 individuals per hectare of the water body).

Seasonal and daily activity, migration

In the Steppe Zone of the Ukraine *E. orbicularis* becomes active during the second half of March and the first half of April, and starts hibernation during the second half of October and November. In the Danube Delta, activity begins after the water temperature reaches 8-10° C; in some years the turtles can be active

Fig. 13:
Female of *Emys orbicularis* looking for a suitable place for oviposition (Lower Dnieper sands near the Dnieper Liman: Solonoozerna area of the Black Sea Biosphere Reserve).

Fig. 14.
Females of *Emys orbicularis* caught in a lake near the Dnieper Liman (vicinity of Geroiske in the Golopristansky district of the Kherson region).

from late February on, or until early December (A.A. FEDORCHENKO, personal communication).

Emys orbicularis spends the nights in the water, during the day it periodically comes out on to the bank or broken reeds to bask. In June-July 1989, European pond turtles were found on the banks of the Danube Delta from 9 h to 20.40 h, most frequently from 11 h to 19 h (this legal time exceeded the local time about 2 hours and Greenwich time by 4 hours). During reproduction, females were encountered on dry land from 17.25 h in the evening until 11.00 h in the morning, but mostly spent 2-3 hours within 18 h-19 h to 22 h-24 h (note: sunset was around 22.00 h) on land.

European pond turtles habitually migrate to non-freezing (deep or spring-fed) lakes and to rivers for hibernation, and back to shallower and warmer water bodies for spending their active periods of life; from small dried-up lakes and holes to deeper bodies of water during drought periods; from deeper parts of a water body to shallow parts and further to dry lands during the reproduction period. Such reproductive migrations may be over short (2-5 m) or long distances (0.5-2 km and more). The shortest migrations take place in wetlands, such as the Danube Delta, where females nest on dykes (as no other dry land is available) situated immediately near the water. The longest reproductive migrations occur in two situations: when sandy plots are far away from a water body (*E. orbicularis* prefers sandy soils for oviposition) or when the sandy area is large. In the latter case, the female may search for suitable places over long time periods. In the Lower Dnieper Sands (vicinity of Rybalche, 27-29.05.1989) I recorded females in the sands and followed their tracks from their aquatic habitat for up to 350, 500 and 600 m.

The ability to cover long distances allows the European pond turtle to escape dried-out places, or to colonise and recolonise steppe and sandy areas after the appearance of water bodies. In the vicinity of Rybalche, turtle tracks of about 2 km in length were followed from a dried lake in the Dnieper Liman on 8.07.1989. By August 1996, the wetlands of Yermakiv Island dried almost completely, and all turtles were concentrated in the deepest canals along dykes, having covered hundreds of meters or even several kilometres. In bomb craters amongst the dunes of the Kozacholagerska Arena of the Lower Dnieper Sands, turtles were found at a distance of 8-12 km from the nearest natural habitats in 1998.

Reproduction

Sex ratio. Females dominate in May-July: among 15 adult individuals caught at the end of May 1979 in the shallow water of the Dnieper Liman, females comprised 73.3%, among 57 adults caught in June-July 1986-1989 on an experimental plot in the Danube Delta, females comprised 94.7%. Such samples reflect the differences in habitats and activities of males and females during the reproductive period, although the sex ratio in populations is usually about 1:1. Such a ratio (55% males and 46% females, n=11) was obtained by net fishing of lakes in the Stanychno-Luganske Section of the Lugansky Nature Reserve (collection of the National Museum of Natural History (NMNH, Kyiv) and similar sex ratios were recorded for the Transcarpatians and the Crimea (SZCZERBAK 1966, SZCZERBAK & SZCZERBAN' 1980), as well as for Daghestan in the the Northern Caucasus region (BANNIKOV 1951).

Sexual maturity, mating. Females reach sexual maturity in the Dnieper and Danube deltas at the age of about 5-7 years. The smallest mature female measured 138.4 mm in carapace length at the age of six years, whereas the youngest (5 years old) had a carapax length of 149.0. Females from the Dnieper Delta seem to be slightly smaller in comparison to those from the Danube Delta (Tab. 1), however at small sample size. According to F.A. KISELEV, European pond turtles copulate in the Crimea in April (SZCZERBAK 1966), and in the Transcarpathians in May (SZCZERBAK & SZCZERBAN' 1980), with an unknown duration of the mating period. In Poland the mating period is short, lasting from a few days to two weeks from late April until the end of the first decade in May (MITRUS & ZEMANEK 1998). In the Danube Delta (on Yermakiv Island) a copulation was recorded on 7.04.1999 (I. GAVRAN, personal communication).

Nesting conditions. In the Steppe Zone of the Ukraine turtles oviposit between June and the first half of July. On 6.06.1963 a mass oviposition was observed near Fedorivka (locality 36 in Fig. 2, personal communication of V.P. SHARPILO). In the Balakleisky district of the Kharkiv region two clutches were laid on 18.06.1977 and 28.06.1968 (materials of the Zoological Museum, Kharkiv University). A female caught near Shchurovo (locality 42) laid eggs on 12.07.1982 (materials of Slaviansky Museum of Local Lore). In the Samarsky forest, the first female digging its nest was recorded on June 1, the last on June 10 1979, with mass oviposition between June 5 and 8; usually oviposition in that area takes place during the second half of June, but May and June of 1979 were very hot and dry (V.L. BULAKHOV, personal communication). During my trip to the Samarsky forest on 15-17.06.1979 no reproducing females but a lot of destroyed clutches were found (see below).

Females dissected on 7.06.1964 in Yagorlitsky Kut (locality 17) had eggs ready for laying in their oviducts (V.P. SHARPILO, personal communication). On islands and banks of the Dnieper Delta and Liman, oviposition takes place in June (S.M. SEMENOV, personal communication). On one of these islands (Krasna Khatka site), ovipositing females were recorded from June 25 onward, with mass oviposition on July 1-3 1952; in vicinity of Gola Pristan (locality 20) the beginning of oviposition was on June 27 1951; near Kizomis (Bilozersky district of Kherson region, right bank of the Dnieper Liman) a turtle laid eggs on 4.07.1956 (PASHCHENKO & MEZHZHERIN 1954, SZCZERBAK 1966). E. SNIESHKUS observed egg-laying on June 24 in Kokhany (near Gola Pristan) and on June 29 in Volyzhin Forest (see locality 15 in Fig. 2), and concluded that in the north (in Lithuania) females lay eggs some weeks earlier (from May 29 onward) than in the south (in Ukraine, Russia or Georgia), where oviposition usually occurs between late June and early July (SNIESHKUS 1998). Females I caught in the Kherson region (one on Biruchy Island on 5.06.1979 and 10 in the Dnieper Liman area on 22-25.05.1979) possessed eggs with completely or almost calcified shells (Fig. 15). Taking into account that in the sands of the Dnieper Liman tracks of turtles were recorded from 20.05.1979 onwards, one can suppose that in the Lower Dnieper area oviposition of *E. orbicularis* starts generally during the final decade of May in years with an early and warm spring. In 1978, reproduction was noted for the same region (in Burkuty, locality 21) on June 23.

Near Troyitske (locality 6) a female laid eggs on the bank of the Turunchuk on 23.06.1987 (R.N. CHERNICHKO, personal communication). In the Danube Delta egg-laying was observed in the vicinity of Vilkove on 27.06.1956 (SZCZERBAK 1966). Our study in the Danube Delta (KOTENKO & FEDORCHENKO 1993 and in lit.) revealed an oviposition period for *E. orbicularis* which begins at the end of May - the middle of June and terminate at the beginning or middle of July. Thus the duration of the egg-laying period lasts between 28-41 days. Mass oviposition (the largest number of simultaneously breeding individuals) used to take place at the first or second week of the reproductive period.

Fig. 15:
Eggs of one clutch of *Emys orbicularis* (same site as Fig. 14).

On cold days (maximum air temperature 14-16° C) females did not oviposit and resumed breeding in the first warm evening. Storms and heavy showers inhibited breeding, but light rain was not an obstacle. If a day was warm, oviposition took place even if the following night was cold (up to 14.0-13.5° C).

Nesting substrate. Dryland areas with different soils are chosen for oviposition (Fig. 4,

5, 7, 8, 12 and most localities indicated in Fig. 2 and listed in the section "habitats"). Turtles mostly lay eggs on sand banks of rivers, on a terrace slope above the flood plain or in the heart of a terrace in dunes, in flat sandy Steppe areas, or on clearings in pine forests. On slopes and dune tops, grass stand is usually sparse (vegetation cover 5-20%), but it is more dense on flat plots (10-30%). In areas with dense soils females prefer to oviposit in loosened soil, as in orchards and kitchen-gardens (in the Danube and Dnieper deltas) and in a mowed maize field (Troyitske). In the Danube Delta they oviposit in the soft sands of Zhebrianske Pasmo (Fig. 4) and seashore and in the firm silty soil of waterways, on banks and dykes. For laying eggs, *E. orbicularis* uses any site with soft soil, not avoiding sites with garbage, rubbish etc. A mass oviposition was observed on a burial ground for cattle in a pine forest near Fedorivka (V.P. SHARPILO, personal communication) and in a heap of coal and clay debris in the Danube Delta (our observations on an experimental plot).

Searching for a place and digging a nest chamber. It should be mentioned that during daylight females are especially timid when choosing a suitable place for making a nest chamber or during digging. When approached they show a flight reaction already at distances of 15-20 m. In the darkness, however, they allow close approach and one can easily observe the process of oviposition with a flashlight. It is even possible to help the female in digging its nest (see below).

In the Danube Delta females left the water for laying eggs between 18.30 and 22.00 in June-July 1989 (KOTENKO & FEDORCHENKO in lit.). They usually search for a suitable nesting site for 5-15 minutes. Such a brief searching period resulted from the site's location (surrounded by wetlands) and its very small area; in the Lower Dnieper Sands, where nesting sites are far away from the aquatic habitats, the searching period may last much longer.

The duration and success of digging depends on the temperature, structure and moisture of the soil, and individual variation. Digging a hole for laying eggs in the firm silty soils of the Danube Delta lasted from 45 min to 4 hours, about 1 hour if it happened before 22 h and 2-4 hours during colder temperatures later in the night. Digging in the sand is much easier and usually lasts 15-30 min under favourable temperature conditions and absence of plant roots). In case of a considerable temperature drop at night, females that started digging holes too late usually were not able to finish with nest construction and left in the early morning hours without success. Such females undertook new attempts to breed the following evening. Too firm or too friable and dry soil renders the digging process more time-consuming, and the absence of one hind leg also prolongs the duration of digging. Two examples clearly illustrate the above. On 4.06.1989 from 19.10 h until 19.55 h a female made two unsuccessful attempts to dig a hole on a heap of coal fragments. At 20.00 h another female started to dig in a more suitable place, slowly until 6.30 h in the morning. Altough the hole was suitable (having the size and shape of a normal nest chamber) the female abandoned it. This female lacked a hind leg, and the air temperature between 23.00 h and 5.00 h was about 14° C. The same female tried to dig a hole in firm soil the next evening from 20.10 h till 22.25 h, then made a new attempt the next morning, but was chased away at 9.00 h. Finally on 6.06.1989 the female completed oviposition at 22.00 h. Another female started digging at 20.15 h on 14.06.1989 at a heap of dry clay clods, at 22.15h moving to another place with the same substrate where she started to dig slowly and indifferently. Because the substrate was too dry, the walls of the hole crumbled continually. At 24.00 h, having observed the female motionless for a long time, I poured some water into the hole and started to help the turtle by digging with a spoon. The female became animated and started to dig more actively. By 0.20 h the hole was big enough and the turtle stopped digging. At 0.28 h I poured more water into the hole, and at 0.30 h the females began to lay her eggs. In the case of too dry and friable substrates, female refrain from laying eggs in their nests, the moistening of a hole stimulates oviposition. About 10 nesting attempts were observed from 7 to 11 a.m. in the next morning. Most of the attempts were conducted by females disturbed on previous evenings.

At the beginning of digging, females usually moisten the soil with water from the

urinary bladder. If oviposition takes place after a heavy rain, moistening of clay or silty soil transforms the substrate into wet mud, making digging (as well as covering the hole after oviposition) more difficult, as the mud adheres to the legs. While digging a hole, some females use their tail as support by pressing the tail against the soil behind the hole, raising themselves, during the digging movement with a limb. Such raising facilitates digging, especially in case of muddy substrate.

Nest chambers. In the silty soil of the experimental plot in the Danube Delta, completed holes usually had the shape of a regular or (more often) asymmetric jug or pear. They were 73-160 mm deep, had a neck length of 30-95 mm (in one atypical nest, 181 mm) and a chamber width of 52-174 mm (Tab. 2). On the sandy soil of the Samarsky Forest, nests predated by foxes and remaining with a well preserved chamber were measured (n=9). The chambers were 100-130 mm deep (114.4 ± 3.3) and 80-100 mm wide (88.3±4.0).

Laying eggs. When a chamber was ready, oviposition started and lasted from 15 to 40 min depending on temperature and number of eggs. Eggs were laid at intervals of 45 sec. to 6 minutes. Long intervals were generally used for repositioning eggs with the hind legs. After oviposition was completed the female rested briefly or immediately started to fill up the hole with soil. The complete burying of the eggs lasted 50-70 min, sometimes even longer. However, occasionally this period was very short (5-15 min) or in case of disturbance or eggs not fitting into the chamber the covering process did not take place. The duration of the whole oviposition process (from the beginning of digging a hole to the end of covering) lasted 75-345 min.

Frequency of oviposition. Data on the Samarsky Forest population suggest that only one clutch is laid per year. Evidence from females caught in the Kherson region also support the assumption of a single annual clutch. Several generations of follicles were present in the ovaries, the biggest reaching 11.1-19.8 mm in diameter, independent of season and presence or absence of eggs in oviducts: before oviposition (22.-25.05.1979, 10 females; 5.06.1979, one female), the first generation of follicles measured 13.0-19.8 mm in diameter, after oviposition (23.06.1974, one female; 30.07.1979, one female; 20.08.1968, two females, collection of the NMNH) the first generation of follicles measured up to 11.1 and 16.2 mm. In one female caught on 25.05.1979, the size of the first generation follicles was between 10.2 to 11.3 mm and without evidence of recently laid eggs or clutches to come (apparently that female did not reproduce that year at all). LUKINA (1971) mentioned that the presence of large follicles in ovaries of females dissected immediately after oviposition did not affirm their readiness to lay a second clutch, as winter follicles measure approximately the same size. Along the Russian Azov Sea coast, only one clutch per year was observed (LUKINA 1971), confirming data from Poland, Germany and other countries (JABLONSKI & JABLONSKA 1998, MITRUS & ZEMANEK 1998, SCHNEEWEISS, ANDREAS & JENDRETZKE 1998 etc.). However, in the Danube flood plain of Austria, two out of 17 females laid two clutches within 25 days (RÖSSLER 1999). Two clutches per year were also recorded for Belarus (DROBENKOV 1999), three for Daghestan (the Northern Caucasus) (BANNIKOV 1951), and one to three annual clutches for Spain, with a higher reproductivity in favourable years (KELLER 1999).

In the Danube Delta two clutches per year were observed for many females (KOTENKO & FEDORCHENKO 1993 and in lit.), with the interval in days between the first and the second oviposition (n=28) varying from 18 to 29 days (direct observations) or from 15 to 32 days (additional indirect data). Not all females produced two clutches, and not every female reproduced each year. During 3-4 sequential years a female produces varying number of annual clutches - usually two or a different combinations of 0, 1 and 2 clutches. In the study population a female on average laid between 1.2 to 1.6 clutches per year.

Clutch size. In the Danube Delta population, the number of eggs per clutch varies from 6 to 16 (KOTENKO & FEDORCHENKO in lit.), in the Dnieper Delta population from 7 to 11 (Tab. 1). Literature data on the Dnieper Delta population reveal 9.16 eggs (n=5) for the vici-

nity of Gola Pristan (1951) and 5 eggs (n=1) for Kizomis (1956) (SZCZERBAK 1966). For other regions of the Steppe Zone of Ukraine the data are as follows: 8, 12 and 13 eggs (n=3) for Yagorlitsky Kut (1964) (V.P. SHARPILO, personal communication), 8 eggs (n=1) for Bereka Zakaznik (1977) and 10 eggs (n=1) for Biruchy Island (1979) (pers. observ.).

Egg size and mass (comp. Tab. 1). One egg of the Danube delta population measured only 29.7 x 19.7 mm and had an unusually small mass of 4.52 g, whereas the mass of other eggs was at least 6.10 g. Females from the Dnieper delta produce bigger eggs (the differences in egg length, width and weight are highly significant), but probably produce smaller clutches (the difference is significant at the level of 95%, however at small sample size). The total fertility is expected to be lower than in the Danube Delta, as probably only one annual clutch is produced. In the Danube Delta females with two clutches produce 20-23 eggs per year (Table 2).

Duration of egg incubation and emergence of the young. For a long time observations on clutches in the Ukraine were missing and all information on the duration of egg incubation of *E. orbicularis* given in the literature (SZCZERBAK 1966, 1998, SZCZERBAK & SZCZERBAN' 1980) was taken from foreign populations or was a rough assumption. There was also a discussion in Ukrainian literature on the question whether hatchlings emerged from their nest chambers in autumn or in spring. According to the established opinion (see a short review in PASHCHENKO & MEZHZHERIN 1954), the hatchlings in the Ukraine do not emerge until the following spring. The same point of view was taken by SZCZERBAK (1966, 1998). However, one and hatchling was caught on 11.10.1953 in the Dnipropetrovsk region near Nikopol on the Dnieper (PASHCHENKO & MEZHZHERIN 1954), and in the Transcarpathian region hatchlings were usually seen on land at the end of August or September (SZCZERBAK & SZCZERBAN' 1980).

The Zoological Museum of Kharkiv University has data on the incubation of two turtle clutches from the Balakleisky district of the Kharkiv region: in a clutch laid on 18.06.1977 in Bereka Zakaznik, recently born hatchlings were found on 16.11.1977; a female caught near station Sezonna laid eggs on 28.06.1968 and her hatchlings appeared on 14.8.1968. Thus, the duration of egg incubation may last up to 150 days but may also be as short as 47 days. In the Russian Azov Sea coastal area, near the Southern Ukraine, the incubation period lasts about 100 days. The young hatch from the beginning of August till the middle of October. A mass migration of hatchlings to water bodies was observed in 1969 in the middle of September (LUKINA 1971).

Incubation periods in the Danube delta last usually 3-4 months (92-121 days) (KOTENKO & FEDORCHENKO in lit.). In years with hot summers some clutches have an incubation period of approximately 2.5 months. The hatchlings stay for a few to several days in their nest chambers and emerge between mid-September and 18th of October; in years with hot summers, the young might emerge 2-3 weeks earlier. Within a clutch a significant variability of incubation length

Parameters	Dnieper Delta (I)			Danube Delta (II)			t
	N	lim. $_{min}$ – lim. $_{max}$	M ± S_M	N	lim. $_{min}$ – lim. $_{max}$	M ± S_M	(I–II)
Carapace length of females	16	144 – 175	161.24 ± 1.99	62	138 – 191	165.87 ± 1.17	-2.01
Egg D_{max}	85	31.2 – 39.8	35.35 ± 0.22	376	27.8 – 37.7	33.35 ± 0.09	8.45
Egg D_{min}	85	20.1 – 22.0	21.15 ± 0.05	376	19.0 – 22.3	20.53 ± 0.03	10.56
Egg mass	85	7.31 – 10.50	9.327 ± 0.068	351	4.52 – 10.85	8.147 ± 0.041	14.86
Clutch size	10	7 – 11	8.70 ± 0.52	59	6 – 16	10.12 ± 0.27	-2.07

Tab. 1:
Parameters of eggs and females of *Emys orbicularis* in the two largest river deltas in the Ukraine.
N – sample size; lim. $_{min}$ – lim. $_{max}$ – minimal and maximal limits of a parameter; M – the arithmetic mean; S_M – standard error of the arithmetic mean; D_{min}, D_{max} – minimal and maximal diameters; t – Student's coefficient of differences. For carapace length straight line measurements were used. All measurements are in millimeters, mass is given in grams. Data on the Danube Delta population – after Kotenko & Fedorchenko (in lit.).

exists: in mid-October within a single nest chamber one can find eggs with alive embryos, hatching individuals, hatchlings and egg shells of individuals which already have left the chamber. Some hatchlings stayed in their nests and emerged only the following spring - in the last days of March, in April or May, some of them were even found still alive in nest chambers in the first half of June. Some young turtles did not succeed to emerge from their nest chambers (either in autumn or in spring) because of the compressed soil above their chambers (KOTENKO & FEDORCHENKO in lit.). In other regions similar findings were observed. In Poland incubation lasts about 3 months, with hatching occurring between the second half of August and the first half of September. In Austria eggs are incubated for 98 to 117 days and the young leave the nest chambers soon after hatching or the following spring (MITRUS & ZEMANEK 1998, RÖSSLER 1999).

The duration of incubation (and hatching success) depends on temperature, and thus on the year's weather conditions, time of oviposition, soil character, and on level of insolation (i. e. on the density of vegetation). Hatching success also depends on the individual behaviour of females. Carelessly laid and damaged eggs with cracks or small holes in the shell are usually lost during incubation. The proportion of hatched eggs varied between clutches from 0 to 100% (Danube delta, n=51; Poland, n=9) (MITRUS & ZEMANEK 1999). For the Danube Delta population the size of hatchlings found in nest chambers in autumn and spring (n=114) and their body mass soon after hatching in autumn (n=105) are given in Table 2.

It is worth mentioning that all reproductive parameters of *E. orbicularis* have a high individual variability and vary accordingly to locality, habitat and weather and apparent contradictions in the literature on oviposition, hatching and emergence become increasingly understandable.

Diet

The nutrition of 17 adult *E. orbicularis* was investigated in the Kherson Region (on Biruchy Island (5.06.1979, n=1) and on the left bank of the Dnieper Liman in the vicinity of Geroiske (22.-25.05.1979, n=15) and Vinogradne (25.07.1979, n=1). Out of 15 turtles caught at the end of May, 14 contained remnants of food in their intestinal tracts. Most remnants were determined to the species level, but here only major groups are considered here.

The diet included many species of invertebrates and a few vertebrates. Gastropoda, Dytiscidae (Coleoptera), Hemiptera and larvae of Diptera and Odonata were the dominant components (Table 3). In the digestive tract of an examined individual 352 molluscs, 60 Odonata larvae, 17 *Ilyocoris cimicoides* L. (Hemiptera, Naucoridae), 14 pupae of Sciomyzidae (Diptera), and up to 11 larvae of Stratiomyidae (Diptera) could be found. In the stomachs of two turtles, imagos of termites *Reticulitermes lucifugus* ROSSI (Isoptera, Rhinodermitidae) were found. Among vertebrates, young fish (1-3 per turtle), fish spawn and small marsh frogs *Rana ridibunda* PALL.

Parameters		N	lim. $_{min}$ – lim. $_{max}$	M ± S_M
Number of eggs	in a clutch	59	6 – 16	10.12 ± 0.27
	in the first clutch	8	9 – 12	10.50 ± 0.38
	in the second clutch	8	8 – 12	10.38 ± 0.50
	in two clutches	8	20 – 23	20.88 ± 0.40
Parameters of nest chambers	chamber depth	20	73 – 160	109.10 ± 3.47
	chamber D_{min}	29	52 – 129	75.24 ± 3.29
	chamber D_{max}	29	57 – 166	93.31 ± 4.29
	neck D_{min}	16	30 – 83	49.00 ± 3.52
	neck D_{max}	16	41 – 95	62.63 ± 3.74
Parameters of hatchlings	carapace length	114	22.5 – 28.0	25.62 ± 0,11
	body mass	105	3.55 – 5.60	4.675 ± 0.498

Tab. 2:
Parameters of clutches, nest chambers and *Emys orbicularis* hatchlings in the Danube Delta (after KOTENKO & FEDORCHENKO, in lit.). N – sample size; lim. $_{min}$ – lim. $_{max}$ - minimal and maximal limits of a parameter; M – the arithmetic mean; S_M – standard error of the arithmetic mean; D_{min}, D_{max} – minimal and maximal diameters. For carapace length straight-line measurements were used. All measurements are in millimetres, mass is given in grams. Data on the Danube Delta population.

(Amphibia, Anura) were recorded. Most plant remains (small fragments of vascular plants and algae) found in the digestive tracts of turtles got there incidentally, together with swallowed invertebrates. Shoots of reed, leaves, stems and roots of other vascular plants, however, were probably actively taken as food source. At the Lower Dnieper near Tsurupinsk pond turtles nibbling on birds of various species shot by hunters were observed by LEVITSKY (1954). Turtles were able to find dead birds and pieces of meat in a few minutes, demonstrating a good sense of smell.

Enemies

Adult turtles are comparatively safe due to their protective carapaces. Adults are occasionally eaten by the Eurasian badger (*Meles meles* L.), more often especially during hibernation by the common otter (*Lutra lutra* L.). Out of 115 food samples taken from common otters during winter, 20% contained European pond turtles. In the Kyiv region entire "cemeteries" of turtles with heads, tails and limbs gnawed by otters were found near ice holes (KORNEEV 1953, 1959, 1967). In the Kharkiv region, the carapaces of turtles were often found under nests of the white-tailed eagle (*Haliaeetus albicilla* L.) (ZUBAROVSKY 1977).

Emys orbicularis clutches are mostly preyed upon by common foxes (*Vulpes vulpes* L.), racoon dogs (*Nyctereutes procyonoides* GRAY), and to a lesser extent by wild pigs (*Sus scrofa* L.), stray dogs and hooded crows (*Corvus corone cornix* L.), all being capable of opening the nests. Cattle and wild ungulates destroy clutches with their hoofs. On the sand terrace of the Samara River (Samarsky Forest opposite Andryivka) 4 plots (500 m², 150 m², 20 m², 17 m²) with 16, 25, 54, 37 clutches, respectively, ruined by foxes were observed on 16.06.1979 (Fig. 16). In some areas of the Danube Delta up to 90% of turtle clutches are destroyed by predators and cattle. Out of 28 clutches under observation in an orchard surrounded by canals and wetlands in 1988, 46.6% were ravaged by racoon dogs and wild pigs, 21.4% by stray dogs and 7.1% by crows; 7.1% were crushed by cattle and an equal percentage was ruined by *E. orbicularis* females digging their holes at places where other females had already oviposited. Holes of foxes were absent in the orchard, explaining the lacking impact of this species. In the presence of holes built by foxes and racoon dogs, high predation pressure of these raptors on *E. orbicularis* can be expected (KOTENKO & FEDORCHENKO 1993). On the Maly Kushchevaty Liman bank in the Russian coastal zone of the Azov Sea, 300 clutches destroyed by foxes, racoon dogs and hooded crows were discovered within one kilometre (LUKINA 1971).

Some elimination of offspring takes place due to infertility or different stages of embryonic development, or while remaining in the nest chamber over winter. Hatchlings are often taken by predators on their way to wetlands in autumn or spring. In some places, where roads separate water bodies from turtles' breeding grounds, the young are occasionally crushed by cars. Only a few percent of the laid eggs yield in viable offspring. In the water, turtles can die during hibernation when the water body freezes down to the bottom. In the Stanychno-Luganske section of the Lugansky Nature Reserve I saw 19 dead turtles in an oxbow lake in spring 1976. In winter 1975/1976 V.G. SULIK observed about 50 hibernating turtles through the transparent ice at the identical site.

Parasites

The list of endoparasites found in *E. orbicularis* within the Steppe Zone of the Ukraine amounts to 14 species (IVANITSKY 1927, 1940, SHEVCHENKO 1963, KHARCHENKO & SOVA 1972, SHARPILO 1976 and his personal communication, some of my material was determined by V.P. SHARPILO):

Protozoa: *Haemogregarina stepanowi* DANILEWSKY;

Trematoda: *Spirhapalum polesianum* EJSMONT, *Diplodiscus subclavatus* (PALL.), *Pleurogenoides* sp., *Telorchis solivagus* (ODHNER), *T. stossichi* GOLDBERGER, *T. parvus* BRAUN, *Astiotrema emydis* EJSMONT, larvae of *Alaria alata* (GOESE);

Monogenoidea: *Polystomoides ocellatum* (RUD.);

Food components	Number of a food component in digestive tracts of *E. orbicularis*		Occurrence of a food component in digestive tracts of *E. orbicularis*	
	Absolute	%	Frequency	%
Spongia (Cornacuspongia)	2	0.09	1	5.88
Mollusca (Gastropoda)	1818	82.67	15	88.24
Arthropoda	369	16.78	17	100.00
Crustacea	2	0.09	2	11.77
Amphipoda	1	0.05	1	5.88
Isopoda	1	0.05	1	5.88
Arachnida (Aranei)	36	1.64	11	64.71
Insecta	331	15.05	17	100.00
Odonata	92	4.18	9	52.94
Lestidae *l*	4	0.18	2	11.77
Coenagrionidae *l, i*	18	0.82	5	29.41
Aeschnidae *l*	2	0.09	1	5.88
Libellulidae *l*	68	3.09	8	47.06
Isoptera	7	0.32	2	11.77
Hemiptera total	43	1.96	9	52.94
Corixidae *i*	4	0.18	3	17.65
Naucoridae *l, i*	35	1.59	7	41.18
Notonectidae *i*	1	0.05	1	5.88
Nepidae *i*	1	0.05	1	5.88
Pentatomidae *i*	1	0.05	1	5.88
Coleoptera total	66	3.00	13	76.47
Dytiscidae *l, i*	46	2.09	11	64.71
Hydrophilidae *l, i*	15	0.68	7	41.18
Scarabaeidae *i*	3	0.14	2	11.77
Chrysomelidae *i*	1	0.05	1	5.88
Trichoptera *l*	1	0.05	1	5.88
Hymenoptera (Parasitica) *i*	1	0.05	1	5.88
Diptera	121	5.50	5	88.24
Nematocera	20	0.99	9	52.94
Tipulidae *l, p*	5	0.23	1	5.88
Limoniidae *l, p*	8	0.36	6	35.29
Chironomidae *l, p*	7	0.32	2	11.77
Brachicera total	99	4.50	13	76.47
Stratiomyidae *l*	33	1.50	11	64.71
Sciomyzidae *p*	65	2.96	10	58.52
Invertebrates total	*2189*	*99.55*	*17*	*100.00*
Chordata	10	0.46	7	41.18
Actinopterygii (Teleostei)	8	0.36	5	29.41
Amphibia	2	0.09	2	11.77
Animals total	*2199*	*100.00*	*17*	*100.00*
Plant remnants			*14*	*82.35*
Inorganic remnants			*17*	*100.00*

Tab. 3:
Content of digestive tracts of 17 individuals of *Emys orbicularis* collected in the Kherson region of Ukraine.
Sample size n = 17; *p* – pupae, *l* – larvae, *i* – imagines.

Nematoda: *Spironoura armenica* (MASSINO), *Spiroxys contortus* (RUD.), larvae of *Physocephalus sexalatus* (MOLIN), *Serpinema microcephalus* (DUJARDIN).

Nine of 13 recorded helminths are obligate and specific parasites of *E. orbicularis*. However, larvae are rare (SHARPILO 1976). Hence *E. orbicularis* parasites are no threat for commercially used mammals, birds or fish. The nematode *S. contortus* is most common, each of 15 individuals of *E. orbicularis* caught in the Dnieper Liman in May 1979 contained up to 50 parasites in the stomachs.

Only one ectoparasite has been recorded. The leech *Haementeria costata* (F. MULL.) is a specific and frequent parasite of *E. orbicularis* in the Kharkov Region (SHEVSHENKO 1965). In the Danube Delta 75.7% of 37 turtles checked in June 1989 were infected with leeches.

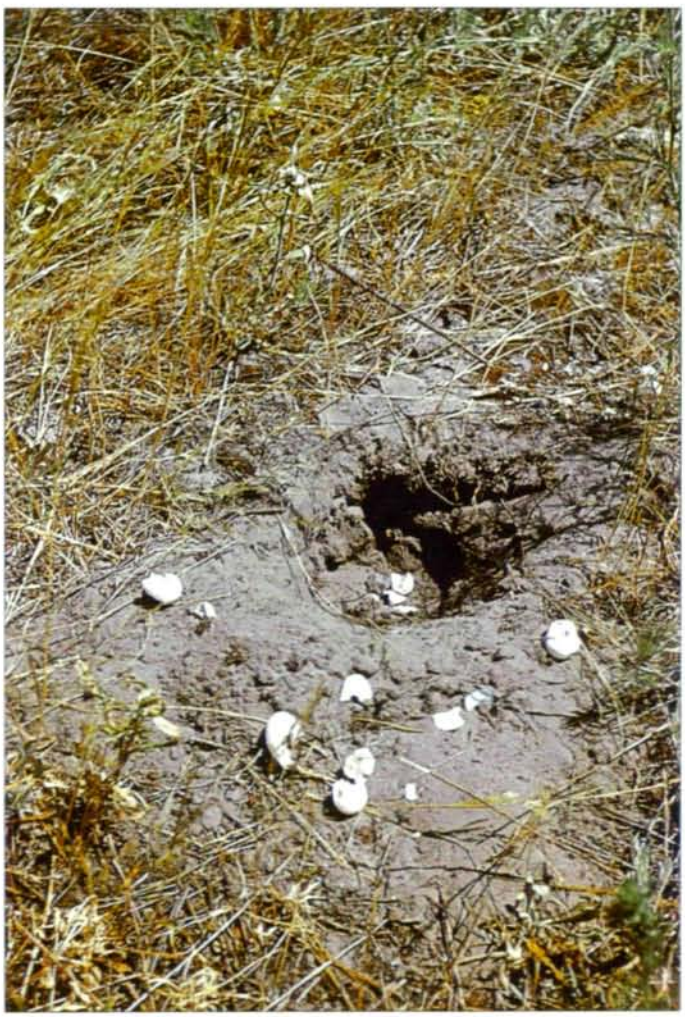


Fig. 16:
A clutch of the European pond turtle *Emys orbicularis* destroyed by a common fox *Vulpes vulpes* (Samarsky Forest, comp. Figs. 10-12).

Conservation

Emys orbicularis is included in the IUCN Red List of Threatened Animals in category LR/nt (Lower Risk near threatened) and as a species of special protection in the Appendix II of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979). In the north of Ukraine, in adjacent Belorussia and in Latvia and Lithuania *E. orbicularis* is listed in the red data books as a rare or endangered species. In Belorussia a population decline has resulted from draining of wetlands (PIKULIK et al. 1988); the same practice is responsible for its decline in the northern part of the Ukraine. In the southern part many populations are in good condition, and Ukrainan, *E. orbicularis* are not critically-endangered. In many regions of the Ukraine *E. o. orbicularis* can be defined as belonging to categories LR/lc (Lower Risk least concern) or LR/nt, without the need for inclusion in the Red Data Book of the Ukraine. In the Steppe Zone of the continental part of Ukraine, owing to river deltas and irrigation canals it does not require special measures of protection. In the Crimea, however, both lowland and highland forms of *E. orbicularis* seem to be threatened (provisionally category Vulnerable) and should be included in the Red Data Book of the Crimea, which is projected for the next few years. The highland form (probably *E. o. hellenica*) should be placed in the Red Data Book of Ukraine.

Zusammenfassung

Die Europäische Sumpfschildkröte (*Emys orbicularis*) in der Steppenzone der Ukraine. *Emys orbicularis* ist in der Steppenzone der Ukraine weit verbreitet und besonders häufig in den Deltas großer Flüsse anzutreffen. Daten über Verbreitung, Habitat, Häufigkeit, jahreszeitliche und Tages-Aktivität, Wanderungen, Reproduktion, Nahrung, Feinde und Parasiten werden präsentiert, die von der Autorin in den Jahren 1974 bis 1999 gesammelt wurden.

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Anschrift des Verfassers:

Dr. Tatiana KOTENKO
Schmalhausen Institute of Zoology
National Academys of Science
Khmelnitsky Str. 15
252030 Kiev
Ukraine
email: Kotenko@iz.freenet.kiev.ua